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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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David Lee Davidson

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EXAMINER

CHIANG, TIMOTHY S

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/534,086	Applicant(s) DAVIDSON ET AL.	
	Examiner TIMOTHY CHIANG	Art Unit 4131	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/06/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1a and 1c teaches a mixture of cycloalkane-alkyl or – polyalkyl components and further teaches "the alkyl moiety contains from 1 to 6 carbon atoms". The claim further teaches "with the proviso that the total number of carbon atoms in the alkyl moiety(ies) is in the range of from 1 to 10". It is unclear which alkyl moiety(ies) is being referred to in the second mentioning as it could pertain to the alkyl moiety of the cycloalkane-alkyl component previously taught with the limitation of 1 to 6 carbon atoms, or a polyalkyl component separate from a cycloalkane-alkyl component, or a mixture of the two options. The applicant is advised to clarify the specified alkyl moieties mentioned in claim 1 and their corresponding carbon range limitations.
3. A broad range together with a narrow range that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The

Art Unit: 4131

Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 1 recites the broad recitation "...the composition has: a cloud point below -100°C", and the claim also recites "preferably in the range of from -110°C to -175°C" which is the narrower statement of the range.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu et al. (US Patent 6,086,782 hereinafter "Hsu").

In regards to independent claim 1, Hsu discloses a heat transfer fluid composition comprising at least one terpene which is further disclosed to include menthane (a cycloalkane-alkyl) and 1,1-dimethylcyclohexane (abstract; Col. 8, table 2). Both said compounds used together are structurally non-identical cycloalkane-alkyl groups with alkyl moieties having between 1-10 carbons and meeting the limitations of

Art Unit: 4131

instant claim 1a. Hsu further discloses acyclic terpenes such as myrcene (an aliphatic hydrocarbon) as suitable compounds for the heat transfer fluid (abstract; Col. 8, table 2). A composition of both an acyclic terpene such as myrcene, and a cyclic terpene such as menthane, meet the limitations of instant claim 1c. Hsu further discloses the composition to remain at a liquid phase at least as low as -175°F (-84°C), and is only characterized to this temperature point due to limitations of testing apparatus (Col. 10, lines 21-24). Hsu further states that "it should be understood By one skilled in the art that the heat transfer fluid compositions of the invention may have, and in many instances do have, freezing point temperatures below -175°F (-84°C)" (col. 10, lines 26-29). In regards to the freezing (cloud point) temperature, vapor pressure at $+175^{\circ}\text{C}$ being below 1300 kPa, and viscosity at $+10^{\circ}\text{C}$ being below 400 cP as taught in the instant claim, these physical properties are understood to be inherent to the heat transfer fluid composition.

In regards to instant claim 2, Hsu discloses the terpenes menthane and 1,1-dimethylcyclohexane as suitable components used in combination for heat transfer fluids (abstract; Col. 8, table 2) and meet the taught limitations of alkyl moieties of cycloalkane-alkyl being either methyl, ethyl, propyl, or mixtures thereof.

In regards to instant claim 3, Hsu discloses myrcene as a suitable acyclic terpene for use in the disclosed heat transfer fluid (abstract; Col. 8, table 2). Myrcene is a C₁₀ aliphatic hydrocarbon.

In regards to instant claim 4 and 5, Hsu discloses a heat transfer fluid composition comprising at least one terpene which is further disclosed to include

Art Unit: 4131

menthane (a cycloalkane-alkyl) and 1,1-dimethylcyclohexane (abstract; Col. 8, table 2), and when used together are structurally non-identical cycloalkane-alkyl groups with alkyl moieties having between 1-10 carbons and meeting the limitations of instant claim 1a. Hsu further discloses acyclic terpenes such as myrcene (an aliphatic hydrocarbon) as suitable compounds for the heat transfer fluid (abstract; Col. 8, table 2). A composition of both an acyclic terpene such as myrcene, and a cyclic terpene such as menthane, meet the limitations of instant claim 1c. Instant claims 4 and 5 teach the viscosity and vapor pressure of the taught composition of instant claim 1 to be below 300 cP and 827 kPa @ +175°C respectively. The physical properties of viscosity and vapor pressure of the disclosed heat transfer fluid would be understood by one skilled in the art to be inherent to the composition.

In regards to instant claim 6, Hsu discloses the terpenes menthane (a cycloalkane-alkyl) and 1,1-dimethylcyclohexane (abstract; Col. 8, table 2), both of which meet the limitations of instant claim 6.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 4131

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 7-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu as applied to claim 1 above, and further in view of Praller et al. (WO 01/92436 A1 hereinafter "Praller").

Hsu discloses a heat transfer fluid composition comprising at least one terpene which is further disclosed to include menthane (a cycloalkane-alkyl) and 1,1-dimethylcyclohexane (abstract; Col. 8, table 2). Both said compounds used together are structurally non-identical cycloalkane-alkyl groups with alkyl moieties having between 1-10 carbons and meeting the limitations of instant claim 1a. Hsu further discloses acyclic terpenes such as myrcene (an aliphatic hydrocarbon) as suitable compounds for the heat transfer fluid (abstract; Col. 8, table 2). A composition of both an acyclic terpene such as myrcene, and a cyclic terpene such as menthane, meet the limitations of instant claim 1c. Hsu further discloses the composition to remain at a liquid phase at least as low as -175°F (-84°C), and is only characterized to this temperature point due to limitations of testing apparatus (Col. 10, lines 21-24). Hsu further states that "it should be understood By one skilled in the art that the heat transfer fluid compositions of the invention may have, and in many instances do have, freezing

Art Unit: 4131

point temperatures below -175°F (-84°C)" (col. 10, lines 26-29). In regards to the freezing (cloud point) temperature, vapor pressure at +175°C being below 1300 kPa, and viscosity at +10°C being below 400 cP as taught in the instant claim, these physical properties are understood to be inherent to the heat transfer fluid composition. Hsu further discloses a composition "consisting of a mixture of d-limonene and cumene, wherein the composition consists of about 50% by volume of cumene in d-limonene" (col. 4, lines 8-10). D-limonene and cumene are both cyclic terpenes usable in the disclosed heat transfer fluid. Hsu further discloses that the commercially available d-limonene in itself comprises 95.6% d-limonene and 2.7% myrcene by weight (col. 5, Table 1). Myrcene is an acyclic terpene.

Hsu differs from the instant application in that, though Hsu discloses a composition of two cyclic terpenes similar in size and volume (d-limonene differs from cumene by an additional carbon atom) at a 1:1 volume ratio (col. 4, lines 8-10), and further discloses a 95.6:2.7 weight ratio between d-limonene and myrcene (col. 5, Table 1), Hsu does not specifically disclose the weight ratio range limitations of instant claims 8, 10-14. Further, in regards to instant claim 9 and 14, Hsu does not specifically disclose the cycloalkane-alkyl component as methylcyclohexane or ethylcyclohexane. Also further, Hsu does not disclose the limitations of aliphatic alkane components of the composition as taught by instant claims 7 and 14.

In regards to instant claims 8, 10-14, the examiner construes the disclosure in Hsu on the composition "consisting of a mixture of d-limonene and cumene, wherein the composition consists of about 50% by volume of cumene in d-limonene" (col. 4, lines 8-

Art Unit: 4131

10) as a weight ratio between two components of the heat transfer fluid applicable to other combinations of cycloalkane-alkyl components, aliphatic hydrocarbon components, or a mixture of cycloalkane-alkyl components and aliphatic hydrocarbon components given that the components in combination have comparable size. One skilled in the art would find obvious to consider 1:1 weight ratios of two-component heat transfer fluids and therefore, find obvious the weight ratio limitations of instant claims 9, 10-14.

In regards to instant claims 9 and 14, Hsu differs from the instant claims as the disclosed 1,1-dimethylcyclohexane compound does not meet the taught limitations of the instant claims. The reference differs from the instant application as little as the absence of one methyl group in the 1 position, or the substitution of the dimethyl group with an ethyl group.

MPEP 2144.09 states the following:

2144.09 [R-6] Close Structural Similarity Between Chemical Compounds

(Homologs, Analogues, Isomers)

**>I. < REJECTION BASED ON CLOSE STRUCTURAL SIMILARITY IS
FOUNDED ON THE EXPECTATION THAT COMPOUNDS SIMILAR IN
STRUCTURE WILL HAVE SIMILAR PROPERTIES**

A prima facie case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities. "An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties." In re Payne, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979). See In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA 1963) (discussed in more detail below) and In re Dillon, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1991)

The prima facie case of obviousness is made in that the difference between the absence of one methyl group in the 1 position, or the substitution of the dimethyl group with an ethyl group on the 1,1-dimethylcyclohexane compound would not significantly

Art Unit: 4131

alter the physical/chemical properties of 1,1-dimethylcyclohexane in its function in heat-transfer fluids.

In the same field of endeavor, Praller discloses a heat transfer fluid based on 2-methyl pentane and 3-methyl pentane (page 2, paragraph 3; claim 3). Also in the same field of endeavor. Paller is analogous art in that the disclosure of Paller is drawn to a heat transfer fluid for low temperature applications comprising cycloalkane-alkyl and aliphatic hydrocarbon components.

Hsu's disclosure on a heat transfer fluid composition comprising at least one terpene which is further disclosed to include menthane (a cycloalkane-alkyl) and 1,1-dimethylcyclohexane (abstract; Col. 8, table 2) and aliphatic hydrocarbon terpenes such as myrcene, combined with the 2-methyl pentane and 3-methyl pentane-based disclosure of Praller encompasses the instant claims 7 and 14 in their entirety.

In regards to instant claims 7 and 14, Hsu establishes the motivation to combine references by stating that, though hydrocarbons (including aliphatic/noncyclic) of 10 carbon are understood to be suitable in the disclosed invention, smaller hydrocarbon chains of similar fundamental chemical structures may be used (col 4, lines 47-51). Praller discloses 2-methyl pentane and 3-methyl pentane as suitable aliphatic hydrocarbons for use in low temperature heat transfer fluids. Therefore it would have been obvious to one skilled in the art at the time of the invention to consider 2-methyl pentane and 3-methyl pentane as an aliphatic hydrocarbon component for the heat transfer fluid either in combination with each other, or in combination with cycloalkane-alkyl compounds.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY CHIANG whose telephone number is (571)270-7348. The examiner can normally be reached on Monday - Thursday 9:00AM-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on 5712721376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/
Supervisory Patent Examiner, Art Unit 4131

/T. C./
Examiner, Art Unit 4131